

## CLAIMS

## 1. A mobile hydrogen generation and supply system comprising

(a) hydrogen precursor storage means for storing one or more hydrogen precursors;

5 (b) one or more hydrogen precursor conversion means selected from the group consisting of means for converting a hydrogen precursor into gaseous hydrogen and means for converting a hydrogen precursor into a hydrogen-containing intermediate;

10 (c) one or more delivery means selected from the group consisting of delivery means for offloading gaseous hydrogen, delivery means for the direct dispensing of hydrogen to hydrogen-powered vehicles or devices, and delivery means for offloading a hydrogen-containing intermediate; and

(d) mobile support means for mounting (a) through (c).

15 2. The system of Claim 1 wherein the one or more hydrogen precursors are selected from the group consisting of water, hydrocarbons, oxygenated hydrocarbons, fixed metal hydrides, transferable metal hydrides, hydrogen-containing porous adsorptive solids, liquid hydrogen, and a mixed gas containing hydrogen.

20 3. The system of Claim 2 wherein the hydrogen precursor conversion means comprises one or more process systems selected from the group consisting of water electrolysis, hydrocarbon reforming, hydrocarbon partial oxidation, oxygenated hydrocarbon reforming, fixed metal hydride heating, heating and/or pressure reduction of hydrogen-containing porous solids, and contacting a stabilized aqueous slurry of a transferable  
25 metal hydride with a catalyst.



4. The system of Claim 1 which further comprises one or more means selected from the group consisting of

(e) means for converting gaseous hydrogen into stored hydrogen;

(f) means for containing stored hydrogen;

5 (g) means for converting stored hydrogen into gaseous hydrogen; and

(h) storage means for storing a hydrogen-containing intermediate.

5. The system of Claim 4 wherein the means for converting the gaseous hydrogen into stored hydrogen comprises one or more process systems selected from the group  
10 consisting of compression, contacting the gaseous hydrogen with one or more hydrogen-reactive metals to form fixed metal hydrides, and contacting the gaseous hydrogen with one or more hydrogen-adsorbing porous solids.

6. The system of Claim 4 wherein the means for containing stored hydrogen comprises  
15 one or more systems selected from the group consisting of pressurized gas cylinders, fixed metal hydride storage cylinders, porous adsorptive solids storage cylinders, and cryogenic liquid storage tanks.

7. The system of Claim 6 wherein the means for converting stored hydrogen into  
20 gaseous hydrogen comprises one or more systems selected from the group consisting of gas pressure regulators, fixed metal hydride storage cylinder heating systems, porous adsorptive solids storage cylinder heating systems, gas compression systems, and cryogenic liquid vaporizers.

25 8. The system of Claim 4 wherein the delivery means comprises one or more systems selected from the group consisting of flexible pressurized gas hoses with gas dispensing connections; a portable crane for lifting pressurized gas cylinders, fixed metal hydride storage cylinders, or porous adsorptive solids storage cylinders; and means for offloading a hydrogen-containing intermediate.

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9. The system of Claim 1 wherein the mobile support means for mounting (a) through (c) comprises transportation means selected from the group consisting of trucks, trailers, tractor-trailers, rail cars, barges, ships, and aircraft.

5 10. A method for the mobile generation and storage of hydrogen comprising

(a) providing a mobile hydrogen generation and supply system comprising hydrogen precursor storage means for storing one or more hydrogen precursors; hydrogen precursor conversion means for converting a hydrogen precursor into gaseous hydrogen; gaseous hydrogen conversion means for converting gaseous  
10 hydrogen into stored hydrogen; hydrogen storage means for containing stored hydrogen; stored hydrogen conversion means for converting stored hydrogen into gaseous hydrogen; gaseous hydrogen delivery means for the direct dispensing of hydrogen to hydrogen-powered vehicles or devices; and mobile support means for mounting the hydrogen precursor storage means, hydrogen precursor  
15 conversion means, gaseous hydrogen conversion means, hydrogen storage means, stored hydrogen conversion means, and gaseous hydrogen delivery means;

(b) transporting the mobile hydrogen generation and supply system to a first location and loading one or more hydrogen precursors into respective  
20 storage means for storing the one or more hydrogen precursors;

(c) transporting the mobile hydrogen generation and supply system from the first location to a second location while concurrently generating gaseous hydrogen by converting one or more of the hydrogen precursors into gaseous hydrogen and converting the gaseous hydrogen into stored hydrogen; and

(d) at a second location, (1) dispensing at least a portion of the stored  
25 hydrogen, or (2) converting at least a portion of the stored hydrogen to gaseous hydrogen and dispensing the gaseous hydrogen, or (3) dispensing at least a portion of the stored hydrogen and converting at least another portion of the stored hydrogen to gaseous hydrogen and dispensing the gaseous hydrogen.

30 11. The method of Claim 10 which further comprises generating gaseous hydrogen at the second location by converting one or more of the hydrogen precursors into gaseous



hydrogen and dispensing the gaseous hydrogen to hydrogen-powered vehicles or devices at the second location.

12. A method for supplying hydrogen to one or more receiving locations comprising

5 (a) providing a mobile hydrogen generation and supply system comprising hydrogen precursor storage means for storing one or more hydrogen precursors; hydrogen precursor conversion means for converting a hydrogen precursor into gaseous hydrogen; gaseous hydrogen conversion means for converting gaseous hydrogen into stored hydrogen; hydrogen storage means for containing stored  
10 hydrogen; stored hydrogen conversion means for converting stored hydrogen into gaseous hydrogen; gaseous hydrogen delivery means for the direct dispensing of hydrogen to hydrogen-powered vehicles or devices; and mobile support means for mounting the hydrogen precursor storage means, hydrogen precursor conversion means, gaseous hydrogen conversion means, hydrogen storage means, stored hydrogen conversion means, and gaseous hydrogen delivery means;

(b) identifying the one or more receiving locations;

(c) determining one or more hydrogen precursors required to generate hydrogen for the one or more receiving locations;

20 (d) determining a source location or locations for the one or more hydrogen precursors and moving the mobile hydrogen generation and supply system to the source location or locations;

(e) loading and storing the one or more hydrogen precursors in the hydrogen precursor storage means at the source location or locations;

25 (f) transporting the mobile hydrogen generation and supply system from the source location or locations to the one or more receiving locations while concurrently generating gaseous hydrogen by converting one or more of the hydrogen precursors into gaseous hydrogen and converting the gaseous hydrogen to stored hydrogen; and

30 (g) at each of the one or more receiving locations, (1) dispensing at least a portion of the stored hydrogen by offloading the hydrogen storage means, or (2)



5 converting at least a portion of the stored hydrogen to gaseous hydrogen and dispensing the gaseous hydrogen, or (3) dispensing at least a portion of the stored hydrogen by offloading the hydrogen storage means and converting at least another portion of the stored hydrogen to gaseous hydrogen and dispensing the gaseous hydrogen.

10 13. The method of Claim 12 wherein one of the one or more hydrogen precursors comprises methanol, the hydrogen precursor conversion means comprises a methanol reformer, and the hydrogen storage means for containing stored hydrogen comprises a fixed metal hydride hydrogen storage system.